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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/022,398	10/30/2001	Cyril Allouche	FR000116	2540

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EXAMINER	
PATEL, SHEFALI D	
ART UNIT	**PAPER NUMBER**
2621	

DATE MAILED: 12/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/022,398	ALLOUCHE, CYRIL	
	Examiner	Art Unit	
	Shefali D Patel	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 October 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,5 and 7-11* is/are rejected.

7)☒ Claim(s) *3 and 6* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 October 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: On page 14 of the Abstract, lines 14-15 need to be deleted. It seems that lines 14-15 are not part of the abstract content.

Appropriate correction is required.

Drawings

2. The drawings are objected to because the box elements in Figures 4a and 4b need to be labeled in accordance with 37 C.F.R. § 1.83(a) as stated infra. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specifically, 37 C.F.R. § 1.83(a) states that "the drawing in a nonprovisional application must show every feature of the invention specified in the claims. However, conventional features disclosed in the description and claims, where their detailed illustration is not essential for a proper understanding of the invention, should be illustrated in the drawing in the form of a graphical drawing symbol or a labeled representation (e.g., a labeled rectangular box)."

Claim Rejections - 35 USC § 112

3. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The terms "rational approximation" and "Residue Technique" are disclosed on page 3 lines 7-12 of the specification. Nowhere in the specification does the applicant disclose what the Residue Technique is or how it is obtained.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Prince et al. (hereinafter, "Prince") ("Motion Estimation from Tagged MR Inage Sequences," IEEE, June 1992).

With regard to claim 1 Prince discloses an image processing method of detecting tag points in a current tagged image of a sequence of tagged images (See the Introduction of Prince on page 238 (column 2) and 239 (column 1), comprising the steps of:

in the current image, estimating points which have optimal intensity values in intensity profiles (page 238 column 2 lines 25-29 and page 239 column 1 section II lines 1-6) and labeling said points as candidate points of a tag (page 239 column 1 section II lines 6-9); using a previously constructed predicted image constituted by predicted tags determined from tag equations (See, Appendix A for the equation on page 247) of a preceding image of the sequence (page 240 column 1 equations 1, 2a, and 2b, lines 18-40) and from spatial and temporal

parameters (spatial parameter 'r' and temporal parameter 't' on page 239 column 1 section II lines 17-24); and,

in the current image, detecting (i.e., tracking) tag points among said candidate points from said previously constructed predicted image (image is predicted by the estimation process on page 241 under section B – Motion Tracking lines 7-16 from the previously constructed images one and two); determining tag equations for the current image from said detected tag points (the variable brightness optical flow (VBOF) equation for tagging is determined on page 241 column 1 at equation 8 to estimate the reference map for predicted images; this was also previously disclosed on page 240 column 1 equations 1, 2a, and 2b, lines 18-40); using said tag equations in the construction of a further predicted image for processing a next image of the sequence (further predicated images for processing a next image is estimated on page 241 under section B and section C lines 10-20 and at equations 14-15).

With regard to claim 4 Prince discloses choosing a given number of privileged points on tags of the preceding image of the sequence (page 241 column 1 section B lines 14-20); calculating, from positions of said privileged points on, at least the preceding image of the sequence, a predicted position of said privileged points (predicted position is calculated as '$\hat{r}$' on page 241); and constructing predicted tags of the predicted image from predicted positions of said privileged points (constructing predicted tags of the points and representing them in the reference map on page 241 column 2 at equations 12 and 13).

With regard to claim 5 Prince discloses estimating a function that minimizes the distance between the predicted positions of privileged points and the result of the application of this function f to these privileged points; applying said function f to tag equations of the preceding

image of the sequence to construct the predicted tags of the predicted image (minimizing the distance by obtaining the error and applying this function to the tag MR imaging equation on page 241 column 2 at equations 17 and 18).

With regard to claim 8 Prince discloses a sequence of MRI tagged images (page 239 column 1 line 17), to track tags on successive images of the sequence (motion tracking inherently includes sequences of images, page 239), comprising steps of: initializing the processing method by implementing one of the methods of Claim 1 (as shown above in claim 1) for the first image of the sequence (page 239 column 1 section II lines 1-16), using a first predicted image which represents the non-deformed modulation pattern (the first image represent the non-deformed pattern having a grid (including parallel and straight lines when t is zero as disclosed on page 239 bottom of column 2 on to the beginning of page 239); iteratively implementing the image processing method of claim 1 for the following images of the sequence (this process is applied to the entire sequence of images, page 241 column 1 section B lines 13-14).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Prince in view of Kraitchman et al. (hereinafter, "Kraitchman")) ("Semi-Automatic Tracking of Myocardial Motion in MR Tagged Images," IEEE, September 1995).

With regard to **claim 7** Prince discloses privileged points as disclosed above in claim 4 and the arguments are not repeated herein, but are incorporated by reference. However, Prince does not expressly disclose privileged points as intersections points. Kraitchman discloses intersections between tags obtained from an MRI image tagged in a grid pattern in two different directions or between tags obtained from two MRI images each tagged in a straight and parallel line pattern in one direction different from the tagging direction of the other (page 422, column 1 and 2 section I paragraph 2), said two MRI images corresponding to a similar step of the sequences, said intersecting being calculated based on the tag equations (page 424 column 1 section II part A and part B on page 425). Prince and Kraitchman are combinable because they are from the same field of endeavor, i.e., motion in MR tagged images. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Kraitchman with Prince. The motivation for doing so is that it will determine the true source and magnitude of the error and will perform better when encounter the large deformation of the tagging stripes, the fading of the tagging stripes due to time relaxation and the blurring of tag stripes due to irregular or rapid motion that are often seen in MR tagging (as suggested by Kraitchman on bottom of page 423 on to top of page 424). Therefore, it would have been obvious to combine Kraitchman with Prince to obtain the invention as specified in claim 7.

8. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Prince in view of Metaxas (US 6,295,464).

With regard to **claim 9** Prince discloses carrying out one of the methods in claim 1 as disclosed above in claim 1 and the arguments are not repeated herein, but are incorporated by

reference. Prince does not expressly disclose a computer program comprising a set of instructions carrying out the method of 1. It is obvious from Prince's invention that a computer would carry out the method. Regardless, Metaxas discloses a computer 411 (Figure 15). Prince and Metaxas are combinable because they are from the same field of endeavor, i.e., MR tagging and processing the images (see col. 5-6 of Metaxas). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Metaxas with Prince. The motivation for doing so is that it is conventional and well known in the art that a computer would process this method in order to come to the results. Therefore, it would have been obvious to combine Metaxas with Prince to obtain the invention as specified in claim 9.

With regard to **claims 10-11** Prince discloses carrying out one of the methods in claim 1 as disclosed above in claim 1 and the arguments are not repeated herein, but are incorporated by reference. Prince does not expressly disclose a system or an apparatus carrying out the method of 1. It is obvious from Prince's invention that a system or an apparatus would carry out the method. Regardless, Metaxas discloses a system as seen in Figure 15. Please note that Metaxas discloses a display on 411 (also an output on printer 413) and a means for acquiring images (sensor 403). See, col. 16 lines 20-29. Prince and Metaxas are combinable because they are from the same field of endeavor, i.e., MR tagging and processing the images (see col. 5-6 of Metaxas). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Metaxas with Prince. The motivation for doing so is that it is conventional and well known in the art that a system of imaging would disclose a display and means for acquiring image (i.e., a scanner, sensor, etc.) in order to process the images.

Therefore, it would have been obvious to combine Metaxas with Prince to obtain the invention as specified in claims 10-11.

Allowable Subject Matter

9. Claims 3 and 6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The closest prior art to Prince and Kraitchman are directed to tagging MR images as disclosed in an independent claim 1.

However, the closest prior art fails to disclose anything about distinguishing two kinds of tags: negative tags corresponding to minimum magnetization and to maximum intensity in the intensity profile, and positive tags corresponding to maximum magnetization and to minimum intensity in the intensity profile; distinguishing two kinds of candidate points: candidate points being optimum value points corresponding to maximum intensity in the intensity profile, and candidate points being optimum value points corresponding to minimum intensity ; selecting points of a negative tag D as being the candidate points corresponding to the maximum intensity, which are situated between the two predicted positive tags surrounding the predicted negative tag that corresponds to the negative tag D, and symmetrically selecting the points of a positive tag as disclosed in claim 3; further the closest prior art fails to disclose anything about function (f) being a similarity expressed as f(z)=lz+c, where l and c are complex parameters. It is for these reasons in combination with all the other elements of the claim that claims 3 and 6 would be

allowable if rewritten in independent form including all of the limitation of the base claim and any intervening claims.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 5,923,770 – 3D Cardiac Motion Recovery System Using Tagged MR Images.

US 5,275,163 – MRI Method and Device for Monitoring Motion of a Part of an Object.

Funka-Lea, et al., "The use of hybrid models to recover cardiac wall motion in tagged MR images," IEEE, 1996, pp. 625-630

Kumar, et al., "Automatic tracking of SPAMM grid and the estimation of deformation parameters from cardiac MR images," 1994, IEEE, pp. 122-132

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shefali D Patel whose telephone number is 703-306-4182. The examiner can normally be reached on M-F 8:00am - 5:00pm (First Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Shefali D Patel
Examiner
Art Unit 2621

December 8, 2004

LEO BOUDREAU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600